

The Theory of Crystals of the Rare Gases

70-3-3-35/36

crystals where the bonds are all of one sort and conversely if the relationships are applicable then the bonds should be all of one sort.

There are 1 table and 6 English references.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN SSSR  
(Physico-technical Institute of the Ac.Sc.USSR)

SUBMITTED: February 15, 1958.

Card 3/3

24(6)

AUTHORS:

Zhitnikov, R.A., Stepanov, A.V.

SOV/57-29-10-19/40

TITLE:

Comparison With Theory of the Experimental Results Obtained by Optical Methods of Stressed State Investigation of Polycrystals (Sravneniye s teoriyey eksperimental'nykh rezul'tatov, davayemykh opticheskim metodom issledovaniya napryazhennykh sostoyaniy v polikristallakh)

PERIODICAL:

Zhurnal tekhnicheskoy fiziki, Vol. 28, Nr 10, pp 2228-2236 (USSR) 1958

ABSTRACT:

This paper presents the information gained by the methods of the theory of elasticity of an anisotropic body in the investigation of the stress distribution at the circumference of a hole in a polycrystalline silver chloride platelet under tension stress (the platelet being produced by pressing or rolling) (Ref 1). This paper gives also an account of the determination of the stressed state produced in such platelets under the action of a single load. The stress distribution determined by theoretical considerations are compared with experimental experience. The methods used in this work are reported in references 4 and 5. It appears that the experimental information is essentially not at variance with theoretical data. In most cases the insufficient accuracy of the experimental results offers a satisfactory ex-

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Comparison With Theory of the Experimental Results  
Obtained by Optical Methods of Stressed State Investigation  
of Polycrystals

SOV/57-28-10-19/40

planation for the divergencies between the two sets of values. Nevertheless, in some cases considerable differences between experimental and theoretical results are found. This is the case, for example, for the action of a single load oriented at an angle of  $45^{\circ}$  to the pressing axis. These differences require further investigation. Yu.M. Chernov carried out the measurements and A.M. Bukhteyev assisted with the calculations. There are 4 figures, 4 tables, and 11 references, 11 of which are Soviet.

SUBMITTED: September 24, 1957

Card 2/2

24(6)

AUTHORS:

Zhitnikov, R.A., Stepanov, A.V.

SOV/57-23-10-20/40

TITLE:

Investigation of the Linear Stressed States in Polycrystalline Silver Chloride by Means of Optical Methods (Issledovaniye lineynykh napryazhennykh sostoyaniy v polikristallicheskom khloristom serebre opticheskim metodom)

PERIODICAL:

Zhurnal tekhnicheskoy fiziki, Vol 28, Nr 10, pp 2237-2247 (USSR) 1958

ABSTRACT:

This is an investigation of the particular features of the piezoelectric behaviour of finely grained quasi-isotropic polycrystalline silver chloride samples under uniform tension stress and under purely elastic and plastic bending stress. It was ascertained that it is possible to determine the averaged stressed states by means of optical methods if such a crystal is subjected to elastic deformations not exceeding certain limits. This method renders visible the stresses caused by elastic and by elastic-plastic deformations, such investigations yielding correct results. The fact is substantiated that the quasi-isotropic polycrystalline silver chloride is a particularly convenient material for the study of the residual stresses remaining in polycrystals of such a structure after plastic deformations. The information gained in the investigation of the elastic-plastic bending of finely

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Investigation of the Linear Stressed States in Polycrystalline Silver Chloride by Means of Optical Methods

SOV/57-23-10-20/40

grained polycrystalline-texture platelets of silver chloride indicates that such samples can be used for an exact investigation by optical methods of the stresses produced in such platelets under elastic and under considerable plastic deformations. It is also possible to determine accurately the residual stress distribution after a plastic deformation. Mere bending results in a simple linear stress for which the character of stress distribution in isotropic and anisotropic platelets can be predicted for elastic and for elastic-plastic deformation. There is no necessity of investigating the elastic and mechanical properties of the quasi-isotropic or of the anisotropic material for the purpose of predicting these states for mere bending. The information presented in this paper bearing on the investigation of mere bending of platelets of polycrystalline silver chloride by means of optical methods and a comparison of this information with calculated data validate the correctness of the values obtained by optical methods for elastic and for plastic deformation of polycrystalline silver chloride of different structure. There are 5 figures and 6 references, 6 of which are Soviet.

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Investigation of the Linear Stressed States in SOV/57-48-10-20/40  
Polycrystalline Silver Chloride by Means of Optical Methods

SUBMITTED: September 24, 1957

Card 3/3

56-34-4-16/60

AUTHORS: Krasnov, V. M., Stepanov, A. V., Shvedko, E. F.

TITLE: The Experimental Determination of the Tension in an Anisotropic Plate Subjected to the Action of a Concentrated Force by Means of the Optical Method II (Eksperimental'noye opredeleniye opticheskim metodom napryazhennogo sostoyaniya v anizotropnoy plastinke, nakhodyashcheyasya pod deystviyem sosredotochennoy sily.II)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 34, Nr 4, pp. 894 - 898 (USSR)

ABSTRACT: This paper is the completion of an earlier work (Ref 1) in which the tensions in anisotropic materials were controlled by the optical method of investigation. In this work the authors determine the tension in a plate produced of a monocrystal with 60% TlBr+40% TlJ. This crystal belongs to the isometric crystal system and the concentrated force is to act along the direction  $[110]$ . In the observation of a stressed anisotropic plate in polarized light the optical interference image depends on the

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The Experimental Determination of the Tension in  
an Anisotropic Plate Subjected to the Action of a Concentrated Force by  
Means of the Optical Method II

56-34-4-16/60

orientation of the acting forces relatively to the crystallographical axes of the plate. This work also is to show those differences in the interference images and also in the tension distribution, which are caused by a change in the orientation of the plate. The model to investigate was made of a monocrystal of the alloy consisting of 40 molecular % TlBr + 60 molecular % TlJ (this alloy belongs to the group of the "transparent metals"). The sample consisted of a 40,5 x 34,0 x 4,15 mm large plate. The pressure acted in the direction  $[110]$ . A figure illustrates the isochromatic curves in the case of circular polarization, obtained by the apparatus  $\Pi \Pi Y$ , which were taken by an interference filter with the mean wave length  $\lambda_{\text{mean}} = \mu\mu$ . The optical phase difference in a horizontal section was measured, too. For the points of this cross section also the optical quantities  $\gamma$  and  $\delta$  were ascertained. From these data then the quantities  $\varphi$  and  $(\sigma_1 - \sigma_2)$  were computed. Finally the following results are obtained: 1) The tensions are radial.

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The Experimental Determination of the Tension in an Anisotropic Plate Subjected to the Action of a Concentrated Force by Means of the Optical Method II 56-34-4-16/60

2)  $\sigma_{\theta} = \sigma_{r\theta} = 0, \sigma_r = 0$  | i.e.  $\sigma_r$  and  $\sigma_{\theta}$  is the main normal stress,

with  $\sigma_r - \sigma_{\theta} = \sigma_r$  holding. 3) In the case of  $\theta = \text{const}$

$\sigma_r = \text{const}$  holds, i.e. the force acting along the radius is inversely proportional to the radius. At the end the author makes some comparisons. Theory and experimental results are in good agreement. Finally the author thanks A.L. Shakh-Budagov for his assistance in the performance of this work. There are 4 figures, 1 table and 7 references, 7 of which are Soviet.

ASSOCIATION: Leningradskiy fiziko-tekhnicheskii institut Akademii nauk SSSR (Leningrad Institute of Physics and Technology, AS USSR)

SUBMITTED: August 8, 1952

1. Piezoelectric crystals--Analysis

Card 3/3

AUTHOR: Stepanov, A. V.

SOV/56-34-6-51/51

TITLE: ~~On the Electrostatic Theory of Ionic Crystals (Ob elektrosticheskoy teorii ionnykh kristallov)~~

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 34, Nr 6, pp. 1661-1662 (USSR)

ABSTRACT: There is no sharp boundary between typically ionic crystals and typically molecular crystals. The ionic compounds evaporate in the form of very simple molecules. Considering the formation of the liquid and of the solid phase as a result of the condensation of the molecular vapor, it may be expected that the molecules in the known degree are also conserved in the crystalline phase. A considerable part of the molecules of the ionic compounds has high dipole moments and the interaction between them may imply a coupling energy of the same order as the sublimation heats of these materials; numerical values are given. The main characteristic of the molecular structure of the crystals is the difference of the interatomic distances between a given atom (ion) and its nearest neighbor. In this case the molecules within the structure may be discerned and the structure may be characterized

Card 1/3

On the Electrostatic Theory of Ionic Crystals

SOV/56-34-6-51/51

by the intermolecular and intramolecular distances. Most of the heteropolar compounds which were investigated up to this date, have the above mentioned properties. The compounds with the structures of NaCl, CsCl, ZnS seem to be exceptions in the group of heteropolar materials. Some properties, for instance the temperature, the melting heat, the heat of evaporation, and the compressibility in the series of the compounds NaCl, HgCl<sub>2</sub>, HCl change continually from typically ionic structures to typically molecular structures. This implies a gradual change of the degree of molecularity of the crystals and the presence of a molecular character of the coupling in crystals of typically ionic compounds. According to the above mentioned facts it can be assumed that some properties of the ionic crystals may be determined by the energy of the "mirror" molecular interaction. The problem of the dimensions and of the form of the molecules in the lattice has to be solved separately. The difference between the typically molecular crystals and the heteropolar molecular crystals may consist of 1) the degree of molecularity, 2) the nature of the intermolecular forces and 3) the nature of the molecular forces.

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On the Electrostatic Theory of Ionic Crystals

807/56-54-6-51/51

ASSOCIATION: Leningradskiy fiziko-tekhnicheskii institut Akademii nauk  
SSSR  
(Leningrad Physico-Technical Institute, AS USSR)

SUBMITTED: November 29, 1956 (initially), and April 4, 1958 (after re-  
vision)

Card 3/3

STEPANOV, A.V.

PHASE I BOOK EXPLORATION SCV/5559

Al'man'shina nauki SSSR. Institut metallurgii. Nauchnyy sovet po probleme zharko-  
prochnykh splavov  
Izvestiya po zharkochnym splavam, t. 5 (Investigations of Heat-Resistant  
Alloys, Vol. 5) Moscow, Izd-vo AN SSSR, 1959. 423 p. Errata slip inserted.  
2,000 copies printed.

Ed. of Publishing House: V.A. Kiselev; Tech. Ed.: I.P. Kur'ain; Editorial  
Board: I.P. Bardin, Academician, G.V. Kur'yakov, Academician, N.V. Aseyev,  
Corresponding Member, USSR Academy of Sciences (Resp. Ed.), I.A. Odintsov,  
I.M. Pavlov, and I.P. Zudin, Candidate of Technical Sciences.

PURPOSE: This book is intended for metallurgical engineers, research workers  
in metallurgy, and may also be of interest to students of advanced courses  
in metallurgy.

CONTENTS: This book, consisting of a number of papers, deals with the proper-  
ties of heat-resistant metals and alloys. Each of the papers is devoted to  
the study of the factors which affect the properties and behavior of metals.  
The effects of various elements such as Cr, Mo, and V on the heat-resistant  
properties of various alloys are studied. Deformability and workability  
of certain metals as related to the thermal conditions are the object of  
another study described. The problems of hydrogen embrittlement, diffusion  
and the deposition of ceramic coatings on metal surfaces by means of  
electrophoresis are examined. One paper describes the apparatus and methods  
used for growing monocrystals of metals. Boron-based metals are critically  
examined and evaluated. Results are given of studies of interatomic bonds  
and the behavior of atoms in metal. Tests of turbine and compressor blades are  
described. No personalities are mentioned. References accompany most  
of the articles.

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AVAILABLE: Library of Congress

Card 9/9

W/10  
5-18-60

27

AUTHOR: A.V. Stepanov SOV/129-59-4-14/17  
TITLE: Lamellar Structure in Austenitic Stainless and High  
Temperature Steels (Plastinchatyye struktury v  
austenitnykh nerzhaveyushchikh i zharoprochnykh stalyakh)  
PERIODICAL: Metallovedeniye i Termicheskaya Obrabotka Metallov,  
1959, Nr 4, pp 57-60 + 1 plate, (USSR)  
ABSTRACT: Combined abstract of information published by C.V. Smith,  
E.J. Dulis and E.G. Houston, (Transactions of American  
Society for Metals, vol 42, 1950), and Chi-Mei-Hsiao and  
E.J. Dulis (Transactions of American Society for Metals,  
vol 49, 1957)  
Card 1/1 There are 3 figures, 2 tables and 2 English references.

18.5100

67797

SOV/180-59-5-7/37

AUTHORS: Gol'tsman, B.M., and Stepanov, A.V. (Leningrad)

TITLE: Method of Producing Strip and Tubes Directly from  
Aluminium and its Alloys

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh  
nauk, Metallurgiya i toplivo, 1959, Nr 5, pp 49-53 (USSR)

ABSTRACT: The authors describe the laboratory automation  
installation developed by them in 1953-55 for the  
continuous casting of aluminium and aluminium-alloy strip  
and tube. The method was proposed by A.V. Stepanov in  
1938-41. A plate with a slot of the appropriate contour  
is placed on the molten surface in a crucible and  
through the slot a thin plate of the slot contour and  
made of material wetted by the metal is caused to touch  
the surface. The metal follows the plate as it is with-  
drawn and, under suitable cooling conditions, solidifies.  
The authors' installations consist of a 3 KW resistance  
furnace with a 170-mm internal diameter graphite  
crucible; a combined shaper and a cooler unit; a  
withdrawing mechanism; arrangement for automatically  
maintaining the liquid level in the crucible constant to  
± 1-2 mm. The installations for strip and tube are very ✓

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SOV/180-59-5-7/37<sup>67797</sup>

## Method of Producing Strip and Tubes Directly from Aluminium and its Alloys

similar. Fig 1 shows a photograph of the installation on which strip up to 120 mm wide and 0.5-1.5 mm thick has been produced from Al + 4.5% Cu alloy at withdrawing speeds of 5-12 m/hour. A diagram of the shaper-cooler unit is shown in Fig 2. The shaper is preferably made of material with a high thermal conductivity; its top surface is flush with the liquid surface. Metal temperature in the shaper is measured with a thermocouple and regulated to  $\pm 5$  °C. A continuous strip over 40 m long has been drawn for up to five hours. Fig 3 shows the installation on which 60- and 100-mm diameter tubes were produced from Al + 4.5% Cu and Al + 12% Si alloys. The shaper (Fig 4) consists of two concentric cast-iron rings attached by cross-pieces and shaped to give a slot convergent upwards. Cooling air is blown on to the emerging tube from a water-cooled ring. The method could be adapted to the production of pipe spirals (Fig 5), or pipes with a complex cross-section. Finned tubes have recently been produced by the authors in collaboration with A.V. Donskiy and V.I. Zaytsev. ✓

Card  
2/3



STEPANOV, A.V.

Properties of crystals with hypothetical close packing structures.  
Fiz. tver. tela 1 no.4:671-673 '59. (MIRA 12:6)

1. Leningradskiy fiziko-tekhnicheskii institut AN SSSR.  
(Crystal lattices)

KLYAVIN, O.V.; STEPANOV, A.V.

Study of the mechanical properties of solids, especially metals, at 4.2°K and lower. Part 2: Rupture test of coarse crystalline aluminum (99,996 o/o) and of the superfluid aluminum alloy V-95. Fiz. tver. tela 1 no.6:955-959 Je '59. (MIRA 12:10)

1. Leningradskiy fiziko-tekhnicheskiy institut AN SSSR.  
(Aluminum--Testing) (Low temperature research)

66281

SOV/181-1-11-16/27

~~24(6)~~ 24,5600

AUTHORS: Klyavin, O. V., Stepanov, A. V.

TITLE: Study of the Mechanic Properties of Metals at the Temperature of Liquid Helium

PERIODICAL: Fizika tverdogo tela, 1959, Vol 1, Nr 11, pp 1733 - 1735 (USSR)

ABSTRACT: At the third (1956) and fourth (1957) All-Union Conference for the Physics of Low Temperatures reports were given on the following investigations: The extension diagrams of the metals Al, Pb, Cu, Ni, Ta, Ti, Cd, Fe-Armco, alloy V-95, steel-3,  $\alpha$ -brass and of plexiglass were measured at 300, 78, 4, 2 and 1.6°K. The following information has been derived from the main results: 1) for the measuring of the extension at temperatures from 4.2 to 1.3°K a method and a corresponding measuring instrument were developed. 2) In the temperature range 4.2 - 1.6°K the temperature has an influence on the mechanic properties of the samples. 3) Numerous jumps occur in the extension diagrams of many metals and alloys, which cannot be explained as yet. 4) A change in the rupture character of aluminum was observed in the range from 4.2 to 1.6°K. 5) The plasticity is maintained in all metals and  $\alpha$ -brass up to 1.6°K. Extension is larger with Al, Cu, Ni and Pb than at 300°K. In Fe-Armco and Ta a noticeable increase of the modulus of elasticity can be observed. 6) In

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AUTHORS: Klyavin, O.V. and Stepanov, A.V. SOV/126-8-2-17/26

TITLE: Study of Mechanical Properties of Solids, Especially Metals, at 4.2 °K Absolute and Lower. I. Testing Polycrystalline Aluminium (99.3%) to Fracture

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 2, pp 274 - 281 (USSR)

ABSTRACT: Tests were carried out on a machine due to A.V. Stepanov (Ref 10) shown in Figure 1. The lower part was placed in a vessel containing liquid nitrogen, which was in turn immersed in liquid helium. Measurements were carried out by an elastic dynamometer. Elongation was measured to  $\pm 0.01$  mm. The rate of elongation was 0.4 - 1.6 mm per minute. The aluminium used contained 0.05% Cu, 0.3% Fe, 0.35% Si and 0.1% other impurities. Samples were heated in vacuo for one hour at 300 °C and furnace-cooled for 3-4 hours. Results are given in Table 1 and Figure 1. The plasticity of aluminium is maintained down to 1.6 °K. The curve at 1.6 °K has a kink just before fracture. At 4.2 °K, the sample fractures with very little necking but at 1.6 °K necking again appears. The

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SOV/126-8-2-17/26

Study of Mechanical Properties of Solids, Especially Metals, at  
4.2 °K Absolute and Lower. I. Testing Polycrystalline Aluminium  
(99.3%) to Fracture

type of fracture is shown in Figure 4 (going from left to right, test temperatures are 300, 78, 4.2, 1.6 °K). At 1.6 °K, the strength is very high and of the order of 150 kg/mm<sup>2</sup>. Figure 5 shows the relationship between strength and temperature. If this curve is extrapolated the theoretical strength (800 kg/mm<sup>2</sup>) is reached at 0.3 °K. Thus, tests at lower temperatures are required. The strengths already obtained are of the same order as those obtained for metal whiskers. Tests on unannealed aluminium gave similar results. Plasticity at 1.6 °K is 5 times greater than at 300 °K (Figure 6). The types of fracture are similar to those for annealed aluminium (Figure 7) and at 1.6 °K kinks are observed in the curve just before fracture.

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SOV/126-8-2-17/26

Study of Mechanical Properties of Solids, Especially Metals, at  
4.2 °K Absolute and Lower. I. Testing polycrystalline Aluminium  
(99.3%) to Fracture

There are 7 figures, 2 tables and 13 references, 5 of  
which are English, 1 German and 7 Soviet.

ASSOCIATION: Leningradskiy fiziko-tekhnicheskii institut ANSSSR  
(Leningrad Physico-technical Institute of the  
Ac.Sc., USSR)

SUBMITTED: July 11, 1958

Card 3/3

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5.4800

67573

SOV/126-8-6-21/24

AUTHORS: Klyavin, O.V. and Stepanov, A.V.

TITLE: Study of the Mechanical Properties of Solids, Especially Metals at a Temperature of  $4.2^{\circ}\text{K}$  and Lower. III.  $\uparrow$  Mechanical Properties of Iron,  $\uparrow$  Titanium,  $\uparrow$  Tantalum and St 2 at a Temperature of  $4.2^{\circ}\text{K}$  and Lower

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 6, pp 922-927 (USSR)

ABSTRACT: This work, which is a continuation of published work (Ref 1,2), used the same procedures and test-piece dimensions. It was reported at the XI Scientific-Technical Session on Heat-Resisting Non-Scaling Alloys and Cermets (Moscow 1957) and the IV All-Union Meeting on Low-Temperature Physics (Moscow, July 1957). The iron used was Armco grade, specimens burned from 12 mm diameter rod being polished with emery paper (14 micron grains) and vacuum annealed at  $600^{\circ}\text{C}$  for 1 hour. The stress-strain diagrams for 300, 78,  $4.2$  and  $1.6^{\circ}\text{K}$  are shown in Fig 1, details of the mechanical properties being given in Table 1, which include results obtained by some other methods. Fig 2a shows the fracture region of iron at  $4.2^{\circ}\text{K}$ . The work showed that there is practically no

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SOV/126-8-6-21/24

Study of the Mechanical Properties of Solids, Especially Metals,  
at a Temperature of 4.2°K and Lower. III. Mechanical Properties of  
Iron, Titanium, Tantalum and St 2 at a Temperature of 4.2°K and Lower

uniform plastic elongation at low temperatures. Similar results were obtained later in the USA (Ref 5,6). The titanium (0.13% Fe, 0.14% Ni, 0.07% C, 0.072% N<sub>2</sub>) specimens were prepared in the same way from 10 mm diameter rod, the annealing temperature being 800°C. Test results are shown in Table 2 and Fig 2, the effect of low temperatures on the properties being similar to those for iron with increasing yield-point stress and disappearance of uniform elongation. Tantalum (0.63% Nb, 0.1% Ti, 0.004% Si, 0.025% Mo, 0.039% W) specimens were turned from 8 mm diameter rod and vacuum annealed at 1100°C for 2 hours. The results are shown in table 3 and Fig 4 and are similar to those for iron. Fig 2<sup>5</sup> shows the fracture region of a tantalum test piece at 4.2°K. No differences in mechanical properties for the superconducting and non-superconducting regions were observed. The preparation of specimens of St 2 steel (0.2% C) was identical to that of iron specimens. The results are shown in Table 4 and Fig 5. With this, as with the other

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SOV/126-8-6-21/24

Study of the Mechanical Properties of Solids, Especially Metals,  
at a Temperature of 4.2°K and Lower. III. Mechanical Properties of  
Iron, Titanium, Tantalum and St 2 at a Temperature of 4.2°K and Lower

materials, sudden changes were found on the stress-strain  
diagram at the lower temperatures. At low temperatures  
the strength of the steel was found to be less than that  
of iron - analogous to the previously reported (Ref 1)  
low-temperature results for aluminium and its alloy.  
The work was assisted by N.M.Reynov, N.G.Andreyev,  
G.A.Gukasov, Yu.M.Chernov, A.M.Polyakov, Yu.A.Burenkov  
and D.D.Baturin of the Institute staff. There are  
5 figures, 4 tables and 9 references, 7 of which are  
Soviet and 2 English.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN SSSR g. Leningrad  
(Physico-Technical Institute, AS USSR, Leningrad)

SUBMITTED: September 29, 1958

Card 3/3

24.7100,24.7500

77003  
SOV/56-37-6-43/55

AUTHORS: Nikanorov, S. P., Stepanov, A. V.

TITLE: Letter to the Editor. Thermal Relationship in Elastic Constants of Potassium Bromide Monocrystals

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37, Nr 6, pp 1814-1815 (USSR)

ABSTRACT: Measurements were made of the Young's modulus E and the shear modulus G in KBr crystals cut out along the directions [100] and [110]. The method was based on complex oscillation, which was described in detail in the first part of this study (cf., A. V. Stepanov, I. M. Eydus, Zhur. Eksp. i Teoret. Fiz., 29, 669, 1955). The resonance frequency was measured with the aid of a heterodyne wavemeter (type 528; precision  $\pm 0.025\%$ ). The relative error in measuring the elastic constants  $s_{11} = 1/E_{[100]}$ ;  $s_{11} = 1/E_{[110]}$ ;  $s_{44} = 1/G_{[100]}$  was 1.2, 1.2, and 0.8%, respectively. The obtained results are summarized in the table below:

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Letter to the Editor. Thermal Relationship  
in Elastic Constants of Potassium Bromide  
Monocrystals

77003

SOV/56-37-6-43/55

$T, ^\circ\text{C}$	$s_{11} \times 10^{13} \text{ cm}^2/\text{dyne}$	$s_{11}^1 \times 10^{13} \text{ cm}^2/\text{dyne}$	$s_{44} \times 10^{13} \text{ cm}^2/\text{dyne}$	$s_{12} \times 10^{13} \text{ cm}^2/\text{dyne}$	$\chi \times 10^{12} \text{ cm}^2/\text{dyne}$
20	30,1	62,1	195	-3,4	7
100	32,6	63,7	199	-4,7	7
200	36,1	63,8	206	-7,5	6
300	40,3	68,5	213	-9,8	6
400	45,7	72,0	219	-11,2	7
500	53,5	76,3	226	-13,9	8
600	63,7	82,0	234	-16,7	9
700	75,2	89,3	241	-17,1	12
730	81,3	91,0	244	-21,3	12

The extrapolation of the temperature dependence of  $E [100]$ ,  $E [110]$ , and  $G [100]$  to the temperature of absolute zero gave the following values of elastic constants at  $T = 0^\circ\text{K}$ :  $s_{11} = 24.0 \times 10^{-13}$ ;  $s_{44} = 180 \times 10^{-13}$ ;  $s_{12} = -2.8 \times 10^{-13} \text{ cm}^2/\text{dyne}$ . These results accord with the data of J. K. Galt (cf., Phys. Rev.,

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24(2)

AUTHOR:

Stepanov, A. V.

SOV/20-124-4-19/67

TITLE:

On the Binding Forces in the Crystals of the Elements of the V. and VI. Groups of the Periodic System of Elements by Mendeleyev (O silakh svyazi v kristallakh elementov V i VI grupp periodicheskoy sistemy elementov Mendeleyeva)

PERIODICAL:

Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 4, pp 800-802 (USSR)

ABSTRACT:

In the present paper the concept of the degree of molecularity  $\beta = \frac{iU}{mU}$  of crystals is introduced. Here  $iU$  denotes the energy of the inner-molecular, and  $mU$  - the energy of the intramolecular interaction, referred to one single bond. The author then endeavors to estimate these quantities for the crystals of the elements of the V. and VI. groups, mainly for crystals of Sb, Bi, Te. For such crystals the degree of deviation of bonds between the particles from the homogeneous bonds has hitherto not been explained. All elements of the V. and VI. group form bi- or polyatomic molecules, the properties of which are given by a table. Apparently the molecules are conserved also in the crystals of these sub-

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On the Binding Forces in the Crystals of the Elements of the V. and VI.  
Groups of the Periodic System of Elements by Mendeleev

stances and  ${}^iU \cong D$  or  $E$  holds.  $D$  here denotes the dissociation energy in kcal/mol and  $E$  - the average binding energy per bond in kcal/mol. When estimating  ${}^mU$  it is assumed that the energy of interaction between atoms is expressed by a two-term formula. One of the terms of this formula characterizes the dependence of the attractive forces, and the other the dependence of the repulsive forces from distance. Next, the properties of a hypothetical crystal are calculated which has a densely packed surface-centered lattice, between the atoms of which the same forces are active as between the atoms in an isolated molecule. The strength of these forces is also given by the above-mentioned diagram. Also the formulas used for calculations are written down; the data calculated with them do not, however, agree with experimental data. This nonagreement is caused: 1) By the difference in structure between the hypothetical and the real crystal. 2) By the difference in the degree of interatomic interaction (averaged over all directions). Both causes depend on the degree of the deviation of interatomic bonds from homogeneous bonds in

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SOV/20-124-4-19/67

On the Binding Forces in the Crystals of the Elements of the V. and VI.  
Groups of the Periodic System of Elements by Mendeleyev

a real crystal. Possible extents for this deviation are suggested. If  $^1U$  is known, it is possible to estimate  $^mU$ , and also the calculated values of  $^mU$  are given by the above-mentioned table. The forces to which the existence of the crystals of Sb, Bi and Te are due, must be determined by the energy  $^mU$  as is also the case with the crystals of nitrogen and oxygen. Like in the case of typically molecular crystals, two types of processes may develop in the crystals of Sb, Bi and Te: The activation energy of one type is determined by  $^1U$  and that of the other by  $^mU$ . The data given here are of essential importance in order to be able to understand various properties (diffusion properties, mechanical and electric properties etc) of the substances investigated by the present paper. There are 1 table and 3 references, 1 of which is Soviet.

ASSOCIATION: Fiziko-tekhnicheskiy institut Akademii nauk SSSR  
(Physico-Technical Institute of the Academy of Sciences, USSR)

Card 3/4

SOV/20-124-4-19/67

On the Binding Forces in the Crystals of the Elements of the V. and VI.  
Groups of the Periodic System of Elements by Mendeleyev

PRESENTED: August 12, 1958, by G. V. Kurdyumov, Academician

SUBMITTED: July 25, 1958

Card 4/4





S/126/60/009/05/025/025

E073/E335

AUTHORS: Klyavin, O.V. and Stepanov, A.V.

TITLE: Postscript to the Paper "Study of the Mechanical Properties of Solids, Particularly Metals, at the Temperature 4.2 °K and less. 1. Tensile Test of Polycrystalline Aluminium (99.3%)" (Same Journal, 1959, Vol 8, Nr 2, p 274)

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol 9, Nr 5, p 800 (USSR)

ABSTRACT: The authors of the paper express their acknowledgment to the Head of the Cryogenic Laboratory of the Fiziko-tekhnicheskii institut AN SSSR (Physics-engineering Institute of the Ac.Sc., USSR), N.M. Reynov, and to the employees of the Institute - G.A. Gukasov, G.N. Andreyev and M.F. Stel'makh for their considerable assistance in carrying out the work described in the paper. The information contained therein was presented at the Third All-Union Conference on Low-temperature Physics, Leningrad, June, 1956. ✓

Card 1/1

22042

S/181/61/003/004/008/030  
B102/B214

24.7500 1035, 1143, 1160

AUTHORS: Nadgornyy, E. M. and Stepanov, A. V.

TITLE: Tensile and bending tests of filamentary crystals

PERIODICAL: Fizika tverdogo tela, v. 3, no. 4, 1961, 1068-1073

TEXT: An investigation of the mechanical properties of filamentary crystals is of interest on account of their particularly high strength approaching the theoretically expected value for ideal single crystals. On account of the small dimensions of these crystals, however, their study meets with technical difficulties. Therefore, the authors have designed a special device for tensile and bending tests of very small samples which is described here. It is shown schematically in Fig. 1. On the upper one of the two base plates (1 and 2) is attached a quartz frame (3) to which the clamp (4) is fastened for tensile tests. The clamp contains a small porcelain tube in which a tungsten or quartz filament of 100  $\mu$  thickness is introduced. The filament carries a drop of adhesive (5) to which one end of the specimen is fastened, its other end being attached to the quartz rod (6). This rod is 150  $\mu$  thick and transmits the load

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3/181/61/003/004/008/030  
B102/B214

Tensile and bending tests ...

onto the sample. For bending tests, a support (7) is fitted on the frame, which consists of a quartz plate with an indentation. This indentation is 0.36, 0.45, 0.54, or 1.2 mm big, depending on the diameter and length of the sample. The filamentary crystal under investigation is placed over the indentation and loaded with the help of the quartz rod (8) at whose lower end is a wedge (9) of 20  $\mu$  thickness. The quartz rod (6 or 8) is connected to a spring (10) whose other end is in a replaceable support. In tensile tests, the rod (6) is connected with the spring (10). If one wants to go from bending to tensile tests, one has only to replace (4) by (7) and to exchange the support (11). (11) is fastened to the plate (12) which is connected to the micrometer screw (14) and can be moved vertically with the help of the rotary disk (13). The load applied to the sample is measured with the spring (10). In bending tests, the plate with the spring is lowered, and in tensile tests it is raised. The optical arrangement for observation is not marked. An eyepiece micrometer measures the displacement of a light ray, which is brought about by the movement of the mirror (16) attached to the spring. The mirror (15) deflects this ray of light by 90°. Filamentary crystals of 1-15  $\mu$  thickness can be tested by this arrangement. The springs used

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B102/B214

Tensile and bending tests ...

consist of phosphor bronze, tungsten, or steel according to the load needed (200 mg to 100 g). The deformation of the sample is measured by a microscope with a magnification of 90-435. The accuracy of deformation measurement is 0.5  $\mu$ . The load is measured with an accuracy of 0.3 mg in tension and 0.03 mg in bending. The rate of deformation can be varied between 12 and 600  $\mu$ /min. With this device, tensile and bending tests of filamentary crystals having a diameter smaller than 20  $\mu$  were made for the following materials: Si, Sn, Te, Zn, ZnS, KCl, NaCl, Cu, and quartz. The results are collected in a table:

	Diameter [ $\mu$ ]	Direction of the axis	maximum strength, kg/mm <sup>2</sup>	
			tension	bending
Cu	10	[001]	120	40
Sn	2-3	[111]	-	270
Te	5 (8-20)	[0001]	80	(36)
Zn	5 (2-3)	[11213]	(50)	40
ZnS	10-30	-	-	75
KCl	10	[001]	-	20
NaCl	10	[001]	12	5
Si	8-20	[111]	-	270

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Tensile and bending tests ...

S/181/61/003/004/008/030  
B102/B214

[Abstracter's note: The table is only partly reproduced.] The authors thank N. P. Nikolayev for assistance. There are 5 figures, 1 table, and 5 references: 3 Soviet-bloc and 2 non-Soviet-bloc.

ASSOCIATION: Fiziko-tekhnicheskiy institut imeni akad. A. F. Ioffe  
AN SSSR Leningrad (Institute of Physics and Technology  
imeni Academician A. F. Ioffe, AS USSR, Leningrad)

SUBMITTED: June 22, 1960

Card 4/5

24,7500

28102  
S/181/61/003/009/036/039  
B108/B138

4

AUTHORS: Chernov, Yu. M., Stepanov, A. V.

TITLE: Temperature dependence of the elastic constants of lithium fluoride single crystals

PERIODICAL: Fizika tverdogo tela, v. 3, no. 9, 1961, 2872-2874

TEXT: The authors continued previous studies (A. V. Stepanov, I. M. Eyduš, ZhETF, 29, 669, 1955 and S. P. Nikanorov, A. V. Stepanov, ZhETF, 37, 1814, 1959). Young's modulus  $E$  and the shear modulus  $G$  of LiF single crystals cut in the  $[100]$  and  $[110]$  directions were measured by the oscillator

method described in the papers cited above. Density was  $2.60 \text{ g/cm}^3$ . The measurements were made with longitudinal and torsional oscillations

between room temperature and  $500^\circ\text{C}$ . The resonance frequency was determined with an accuracy of 0.05%. The relative error in measuring the elastic

constants  $S_{11} = \frac{1}{E_{[100]}}$ ,  $S'_{11} = \frac{1}{E_{[110]}}$ , and  $S_{44} = \frac{1}{G_{[100]}}$  amounted to about

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Temperature dependence of the elastic ... <sup>28102</sup>  
S/181/61/003/009/036/039  
B108/B138

+

3%. The error in determining the constant  $S_{12} = 2S_{11}' - S_{11} - \frac{1}{2}S_{44}$  and the compressibility  $\chi = 3(S_{11} + 2S_{12})$  was greater. The thermal-expansion data were taken from Ref. 5. The results of the measurements are presented in Table 1. They agree with those given in Ref. 6 (C. Suss. C. r. Akad. Sci., 1958, 247, no. 16, 1174). Extrapolation of the nearly linear temperature dependence of  $E[100]$ ,  $E[110]$ , and  $G[100]$  to absolute zero and to melting point gives the values shown in Table 2. The following conclusions are drawn: 1) The elastic constants of LiF are highly temperature dependent. 2) The character of the elastic anisotropy is maintained throughout the entire temperature range between absolute zero and melting point. There are 1 figure, 2 tables, and 7 references: 2 Soviet and 5 non-Soviet. The 3 references to English-language publications read as follows: L. Hunter, S. Siegel, Phys. Rev., 61, 84, 1942; L. Balamuth, Phys. Rev., 45, 715, 1934; C. V. Briscoe, C. F. Squire, Phys. Rev., 106, 1175, 1957.

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28102

Temperature dependence of the elastic ...

S/181/61/003/009/036/039  
B108/B138

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ASSOCIATION: Fiziko-tekhnicheskiy institut im. A. F. Ioffe AN SSSR  
Leningrad (Institute of Physics and Technology imeni A. F.  
Ioffe of the AS USSR Leningrad).

SUBMITTED: May 15, 1961

Card 3/4



NIKANOROV, S.P.; STEPANOV, A.V.

Temperature dependence of the elastic constants of potassium  
iodide single crystals. Fiz.tver.tela 3 no.11:3551-3553 N '61.  
(MIRA 14:10)

1. Fiziko-tekhnicheskiy institut im. A.F.Ioffe AN SSSR, Leningrad.  
(Potassium iodide crystals) (Elasticity)

STEPANOV, A. V.; NADGORNYY, E. M.;;

"Artificial slip formation and dislocation structure of  
Sodium Chloride Crystals"

Paper was submitted at the International Conference on  
Crystal Lattice Defects at Kyoto, 7-12 Sep '62

(for Stepanov, a. v.) Physico Technical Institute of Acad. Sci. USSR

40892

S/161/62/004/009/030/045  
B101/B186

24.7500,

AUTHORS: Nikanorov, S. P., and Stepanov, A. V.  
TITLE: Temperature dependence of the elasticity constants of potassium chloride and sodium chloride single crystals  
PERIODICAL: Fizika tverdogo tela, v. 4, no. 9, 1962, 2576-2584

TEXT: The differential method suggested by I. W. Marx, I. M. Sivertsen (Journ. Appl. Phys., 24, 81, 1953) was used to measure the temperature dependence of alkali halide single crystals. Using this method, a long specimen is heated at one end only, the glued joint between specimen and piezoquartz lying outside the heater. The measured results of the differential method were compared with those obtained by the usual method of the three-part oscillator, and proved to be more accurate. The good agreement of the results obtained for NaCl with the published data (L. Hunter and S. Siegel, Phys. Rev., 61, 84, 1942) further confirmed the dependability of the differential method. The following constants were determined for KCl between 20 and 600°C and for NaF between 20 and 500°C:  
 $s'_{11} = 1/E_{100}$ ;  $s'_{11} = 1/E_{110}$ ;  $s'_{44} = 1/G_{100}$ ;  $s'_{44} = 1/G_{110}$ ;  $s'_{12} = 1/E_{110} - 1/G_{110}$ ;  
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S/181/62/004/009/030/045  
B101/B186

Temperature dependence of the ...

the compressibility  $\kappa = 3(s_{11} + 2s_{12})$ , and the factor of elastic anisotropy  $A = 2(s_{11} - s_{12})/s_{44}$  were calculated, and the data for 0°K and for the melting point were obtained by extrapolation. Some of these data for KCl are:

T, °K	$s_{11}$	$s'_{11}$	$s_{44}$	$s'_{44}$	$s_{12}$	$\kappa$	A
0	0.201 <sub>8</sub>	0.484 <sub>5</sub>	1.48 <sub>1</sub>	0.97 <sub>8</sub>	-0.004	0.58	0.28
293	0.253 <sub>1</sub>	.503 <sub>3</sub>	1.59 <sub>5</sub>	1.08 <sub>0</sub>	-0.037	0.537	0.36
373	.333 <sub>5</sub>	.54 <sub>4</sub>	.71 <sub>5</sub>	.23 <sub>8</sub>	.07 <sub>5</sub>	.55	.48
373	.508 <sub>1</sub>	.64 <sub>1</sub>	.86 <sub>9</sub>	.53 <sub>1</sub>	.12 <sub>5</sub>	.77	.68
m.p. = 1049	0.731 <sub>5</sub>	0.74 <sub>4</sub>	1.97 <sub>6</sub>	1.82 <sub>5</sub>	-0.16 <sub>8</sub>	1.19	0.91

and for NaF:

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B101/B186

Temperature dependence of the ...

T, °K	$s_{11}$	$s'_{11}$	$s_{44}$	$s'_{44}$	$s_{12}$	$\kappa$	$\Lambda$
0	0.096 <sub>7</sub>	0.121 <sub>6</sub>	0.329 <sub>4</sub>	-	-0.01 <sub>8</sub>	0.18	0.70
293	0.114 <sub>5</sub>	0.135 <sub>5</sub>	0.353 <sub>5</sub>	-	-0.02 <sub>0</sub>	0.22	0.76
573	.137 <sub>2</sub>	.151 <sub>4</sub>	.379 <sub>8</sub>	-	.02 <sub>4</sub>	.27	.85
773	.157 <sub>3</sub>	.165 <sub>4</sub>	.400 <sub>9</sub>	-	.02 <sub>7</sub>	.31	.92
m.p. =							
1265	0.240 <sub>6</sub>	0.214 <sub>6</sub>	0.464 <sub>7</sub>	-	-0.04 <sub>4</sub>	0.46	1.22

There are 4 figures and 3 tables. The most important English-language references are: F. D. Enck, Phys. Rev., 119, 1873, 1960; M. H. Norwood, C. V. Briscoe, Phys. Rev., 112, 45, 1958.

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Temperature dependence of the ...

S/181/62/004/009/030/045  
B101/B186

ASSOCIATION: Fiziko-tekhnicheskii institut im. A. F. Ioffe AN SSSR,  
Leningrad (Physicotechnical Institute imeni A. F. Ioffe  
AS USSR, Leningrad)

SUBMITTED: May 17, 1962

Card 4/4

STEPANOV, A. V.; NADGORNYY, E. M.

"Artificial slip formation and dislocation structure of sodium chloride."

report submitted for 6th Gen Assembly, Intl Union of Crystallography, Rome,  
9 Sep 63.

Physico-Tech Inst, AS USSR, Leningrad.

ACCESSION NR AM1032510

BOOK EXPLOITATION

S/

Stepanov, Aleksandr Vasil'yevich

Future of metal-working (Budushcheye metalloobrabotki), [Leningrad], Lenizdat, 1963, 129 p. illus., biblio. 5,000 copies printed. Series note: Nauka i kommunizm.

TOPIC TAGS: metal working, strip, sheet, tubing, panel, rod, continuous casting, molten metal

PURPOSE AND COVERAGE: This book examines new methods of obtaining diverse articles (sheet, tubing, panels, rods, etc. and various shapes) from metals, alloys, and other materials directly from molten metal without machining. These methods still are not used in production, however, in the future they will take their place in metal-working practice. The book is intended for a wide audience interested in ways of developing the technology of the future, the technology of communist society.

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ACCESSION NR AM4032510

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ACCESSION NR AM1032510

SUB CODE: ML

SUBMITTED: 03Apr63

NR REF SOV: 024

OTHER: 004

DATE ACQ: 07Apr64

Card 3/3

STEpanov A.V.  
AID Nr. 98619 June  
ELASTIC MECHANICAL PROPERTIES OF LAMINATED INHOMOGENEOUS  
MEDIA (USSR)

Gol'dfarb, V. M., and A. V. Stepanov. Zhurnal prikladnoy mekhaniki i  
tekhnicheskoy fiziki, no. 2, Mar-Apr 1963, 100-107.  
S/207/63/000/002/011/025

The elastic behavior of inhomogeneous "thin-laminated" media under arbitrary loading is discussed. The term "thin-laminated" means that there are many layers in a volume element in which the state of stress is close to a homogeneous one (pure tension, compression, etc.). The layers are assumed to be isotropic and rigidly interconnected; their thicknesses are small relative to the element's dimensions, and the stress field within each layer is homogeneous. The medium is treated as homogeneous and anisotropic, with symmetry about an axis normal to the planes of the layers, so that the elastic constants of the medium can be determined by using the equations of the generalized Hooke law to connect the averaged values of stresses and strains of the volume element. The stresses in an individual layer are determined in terms of the components of its averaged state of stress. The averaged elastic constants and

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AID Nr. 986-7 10 June

ELASTIC MECHANICAL PROPERTIES [Cont'd]

s/207/63/000/002/011/025

stresses in the case of anisotropic layers are also discussed, and associated formulas which can be used for the stress analysis of polycrystalline media are derived. The formulas give results which are in good agreement with experimental data. The dependence of the elastic constants of a thin-laminated medium on its geometry (i. e. , relative thickness of layers) is discussed. Because of the difficulties in investigating this dependence theoretically, a method of using empirical data to obtain corrections for analytical formulas is outlined. [VK]

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S/181/63/005/002/038/051  
B102/B186

AUTHORS: Nikanorov, S. P., Tatarchenko, V. A., and Stepanov, A. V.

TITLE: Temperature dependence of the elastic constants of cesium  
monocrystalline bromide and iodide

PERIODICAL: Fizika tverdogo tela, v. 5, no. 2, 1963, 619 - 626

TEXT: The temperature dependence of high-purity CsI and CsBr monocrystal-  
line samples was measured in the range from room temperature almost up to  
the melting point using the piezoelectric oscillator method. The samples  
were cut from (100) plates in the 100 and 110 directions and then annealed  
at 300°C for 16 and in some cases for 200 hrs. The length of the samples  
was such that  $l \approx n\lambda/2$ ,  $n = 3-6$ . The method of measuring Young's modulus  
( $E_{100}$ ,  $E_{110}$ ) and the shear modulus ( $G_{100}$ ,  $G_{110}$ ) is published in FTT, 4,  
2576, 1962. After each single measurement the sample is shortened by  $\lambda/2$   
and the arithmetic mean of the values measured is taken as final result.  
For e.g.  $E_{110}$  and a long CsBr sample the following was obtained:

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Temperature of the elastic ...

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B102/B186

$$\leftarrow E_{110} = 2.10 \rightarrow$$

2.17	2.14	2.13	2.03	2.08	////
------	------	------	------	------	------

sample piezoquartz  
( $E_{110}$ ) mean = 2.11. From the  $E(T)$  and  $G(T)$  resp.,  $s(T)$  graphs obtained for a series of samples it can be seen that elastic anisotropy increases with temperature. The exponential rise of  $s_{44} = G_{100}^{-1}$  cannot be explained by theory. The mean values of  $s_{11} = E_{100}^{-1}$ ,  $s_{12} = E_{110}^{-1} - \frac{1}{2}G_{110}^{-1}$  and  $s_{44}$  obtained for CsBr (0.34, 0.96 and  $-0.08 \cdot 10^{-11}$  cm<sup>2</sup>/dyne) by extrapolating from room temperature to 0°K, are compared with the theoretical values of K. S. Krishnan and S. K. Roy (Proc. Roy. Soc. London, 210, 481, 1952) and experiments at 4.2°K by B. Marshall (Phys. Rev. 121, 72, 1961). Agreement is good, except for  $s_{44}$ . There are 5 figures and 2 tables.

ASSOCIATION: Fiziko-tekhnicheskiy institut im. A. F. Ioffe AN SSSR, Leningrad (Physicotechnical Institute imeni A. F. Ioffe AS USSR, Leningrad)

Card 2/3

LMH98

S/181/63/005/001/013/064  
B102/B186

AUTHORS: Stepanov, A. V., and Tsivinskiy, S. V.  
TITLE: Production and properties of germanium dendrite crystals  
PERIODICAL: Fizika tverdogo tela, v. 5, no. 1, 1963, 81-90

TEXT: The possibility, which now exists, of building up complete radio circuits from small semiconductor crystals of different shapes and different orientations, and even of automating this production (Westinghouse Engineer, 19, 4, 113, 1959), lends great importance to the production of suitable crystals. Only two methods have hitherto been known: that of A.V. Stepanov (ZhTF, 29, 3, 381, 1959; 3, 394, 1959) and the method of dendrite crystallization developed in the U.S.A. This method has not hitherto been examined thoroughly as regards how production conditions affect the crystal properties. The factors influencing the shape, the electrical properties, and the dislocation distribution in dendrites are studied here. The dendrites were pulled from a melt in a crucible placed at the bottom of a quartz container, the crucible being constructed as an electric resistance furnace. The pressure in the

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Production and properties of ...

S/181/63/005/001/013/064  
B102/B186

quartz container was  $10^{-4}$ - $2 \cdot 10^{-5}$  mm Hg. After germanium had been melted it was overheated by  $6-14^{\circ}\text{C}$ , the furnace was then switched off and cooled at a rate of  $1.2 - 1.6^{\circ}\text{C}/\text{sec}$ . Until the pulling was begun the rate was  $0.4 - 0.8^{\circ}\text{C}/\text{sec}$ . The following factors and their effects on the crystallization were studied: shape of the crucible (effect on the form of the dendrites; formation of side branches); material of the crucible (effect on the type of growth, formation of side branches and nucleation probability); amount of germanium in the crucible (effect on the number of dendrites per seed), effect of overheating after melting (strong overheating ( $45-85^{\circ}\text{C}$ ) leads to dendrite crystallization if the melt is undercooled about  $5^{\circ}\text{C}$  lower than after minor overheatings ( $6-14^{\circ}$ )); temperature of the introduction of the seed into the melt (this temperature should be somewhat lower than the melting temperature, otherwise polyhedra will be formed or formation of dendrite will be uncontrollable; degree of undercooling before dendrite pulling (strong undercooling ( $30^{\circ}\text{C}$ ) gives thick ( $0.9-1.5$  mm) dendrites with poor faces; undercooling of  $15-17^{\circ}\text{C}$  gives thin ( $0.2-0.35$  mm) dendrites with good faces); temperature change of the melt during the crystal growth (effect on the constancy of the dimensions and the uniformity of the electrical properties). The

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S/181/63/005/004/004/047  
B102/B186

AUTHORS: Nadgornyy, E. M., and Stepanov, A. V.

TITLE: Investigation of dislocations in NaCl crystals

PERIODICAL: Fizika tverdogo tela, v. 5, no. 4, 1963, 998-1005

TEXT: Three groups of NaCl single crystals with different contents of Ca impurity ( $<10^{-3}\%$ , I;  $10^{-3}\%$ , II; and  $10^{-2}\%$ , III) were examined as to their dislocations and mechanical properties after annealing according to various modes. The dislocations were observed both by an optical method (ZhRFKhO, 58, 817, 1926) and by selective etching with a 10%  $\text{CaCl}_2$  solution in methyl alcohol to which 20%  $\text{H}_2\text{O}$  was added. With the exception of several special cases the crystals were heated up to  $680^\circ\text{C}$  during 8 hrs and, after a holding time of 48 hrs, cooled at a rate of  $5^\circ/\text{hr}$ . In order to clarify the effect of holding time and temperature, some specimens were held at temperatures between 300 and  $500^\circ\text{C}$  for different times and then cooled at rates from 15 to  $20^\circ/\text{min}$ . The optical yield point, the tangential stress and the relative background density were determined, Group III was found to show

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Investigation of dislocations...

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the following peculiarities as compared with I: (1) a reduction of the normal etching rate of edge and screw dislocations by about 30% when the tangential etching rate remains constant; (2) absence of etching wells which are less deep than the usual dislocation well along the traces of the edge and screw dislocations; (3) the appearance of a background, flat etching wells of different sizes in slowly cooled crystals and change in the background density in the case of rapid cooling. The background is due to the presence of the Ca impurities and is assumed to be related to the accumulation of point defects. A clear relation is found to exist between the background density of group III and the yield point. There are 6 figures and 2 tables.

ASSOCIATION: Fiziko-tekhnicheskiy institut im. A. F. Ioffe AN SSSR Leningrad (Physicotechnical Institute imeni A. F. Ioffe AS USSR, Leningrad)

SUBMITTED: October 4, 1962

Card 2/2

S/181/63/005/004/005/047  
B102/B186

AUTHORS: Nadgornyy, E. M., and Stepanov, A. V.  
TITLE: Artificial slip formation and dislocation structure in sodium chloride crystals  
PERIODICAL: Fizika tverdogo tela, v. 5, no. 4, 1963, 1006 - 1020

TEXT: The authors continue previous investigations (FTT, v. 5, no. 4, 998) by studying the dislocation structure arising in NaCl crystals of differing purity by the method of selective etching. Production structure and properties of the dislocation rosettes, such as pricking rosettes, impact and notch rosettes are investigated. These rosettes arise at the beginning of artificial slippage. The motion of the dislocations under load as well as after removing the load was studied, and the character of slip and transverse slip was analyzed for three types of NaCl single crystals with Ca impurities  $<10^{-3}\%$  (I),  $\sim 10^{-3}\%$  (II) and  $\sim 10^{-2}\%$  (III). In general, the behavior of the dislocations and the slip characteristics depend on the Ca concentration, i.e. there exists a considerable difference between I on the one and II and III on the other hand. E.g. after removing the load, the inner stresses cause a considerable dislocation redistribution in I, and

Card 1/2

Artificial slip formation and...

S/181/63/005/004/005/047  
B102/B186

virtually do not affect II and III. The differences in the dislocation structures of these types is explained by the different character of transverse slippage observed experimentally. The mechanism of transverse slippage is mainly determined by the Ca impurities. There are 16 figures.

ASSOCIATION: Fiziko-tekhnicheskiy institut im. A. F. Ioffe AN SSSR Leningrad (Physicotechnical Institute imeni A. F. Ioffe AS USSR, Leningrad)

SUBMITTED: October 4, 1962

Card 2/2

S/181/63/005/004/006/047  
B102/B186

AUTHORS: Gutmanas, E. Yu., Nadgornyy, E. M., and Stepanov, A. V.

TITLE: Investigation of the movement of dislocations in sodium chloride crystals

PERIODICAL: Fizika tverdogo tela, v. 5, no. 4, 1963, 1021 - 1026

TEXT: The authors studied the motion of single dislocations in mono-crystalline NaCl samples of different purity (Ca content  $< 10^{-3}\%$  (I),  $\sim 10^{-2}\%$  (III)) in a large interval of loads applied, and measured the velocities of such dislocations. As in the previous investigations (cf. present periodical) the method of selective etching was applied to measure the load dependence of the velocities of screw and edge dislocations. For the investigations crystals were chosen with no more than  $10^4$  dislocations per  $\text{cm}^2$  and block areas of about  $1 \text{ mm}^2$ ; the dislocations were observed at the  $\{100\}$  slip plane. The graphs obtained for I and III,  $\log v_d = f(\log \tau)$ ,  $\tau$  being the load ( $\text{g/mm}^2$ ), were compared with the corresponding curves obtained for LiF by Johnston and Gilman (J. Appl. Phys., 30, 129, 1959); comparison. Card 1/2

Investigation of the movement...

S/181/63/005/004/006/047  
B102/B186

is made for two types of LiF:  $\text{LiF}_T$  with high and  $\text{LiF}_M$  with low yield point. The  $v(\tau)$  curve obtained for III coincides with that for  $\text{LiF}_M$ . In general,  $v_d \sim \tau^n$  is valid for  $v_d > 10^{-4} - 10^{-5}$  cm/sec, where  $n \approx 8$  (for I),  $n \approx 17$  (III),  $n \approx 25$  ( $\text{LiF}_T$ ). Not only does the slope of the curves increase with  $I \rightarrow III \rightarrow \text{LiF}_T$  but also the curves become shifted toward higher  $\tau$ . In the case of small velocities ( $< 10^{-4} - 10^{-3}$  cm/sec)  $v_d = A_1 e^{B_1 \tau}$ , with  $A_1 = 3.5 \cdot 10^{-8}$  ( $1.0 \cdot 10^{-12}$ ) and  $B_1 = 154$  (80) for I (III). The relation  $v_d = A_2 e^{-B_2/\tau}$ , proposed for LiF, may be applied to NaCl only in the case of high velocities. There are 5 figures and 2 tables.

ASSOCIATION: Fiziko-tekhnicheskiy institut im. A. F. Ioffe AN SSSR Leningrad (Physicotechnical Institute imeni A. F. Ioffe AS USSR, Leningrad)

SUBMITTED: October 4, 1962

Card 2/2

TSIVINSKIY, S.V.; STEPANOV, A.V.

Determination of the orientation of germanium crystals using an optical method. Zav.lab. 29 no.11:1333-1335 '63. (MIRA 16:12)

1. Leningradskiy fiziko-tekhnicheskii institut im. A.F.Ioffe AN SSSR.

L 2273-66 EMT(m)/EPA(w)-2/EMA(m)-2 IJP(c) GS  
 ACCESSION NR: AT5007942 UR /0000/64/000/000/0600/0603  
 AUTHOR: Alekseyev, A. G.; Basargin, Yu. G.; Zhukov, I. F.; Lavrent'yev, Yu. K.; Litunovskiy, R. M.; Malyshev, I. F.; Nevrov, N. P.; Stepanov, A. V.; Tuzov, I. V.  
 TITLE: Basic characteristics of the isochronous cyclotron with variable particle energy  
 SOURCE: International Conference on High Energy Accelerators, Dubna, 1963. Trudy. Moscow, Atomizdat, 1964, 600-603  
 TOPIC TAGS: high energy accelerator, ion beam, cyclotron  
 ABSTRACT: At the Scientific Research Institute of Electrophysical Equipment im. D. V. Yefremov, a 2.4-meter cyclotron is being developed with a magnetic field having 3-dimensional variation. This cyclotron is intended to accelerate particles with  $Z/A$  equal to 0.125-1 in a wide range of energies. The limits of energy variation, in Mev, are: 7.5-100 (protons); 5-60 (deuterons), 10-120 (alpha-particles), and 10-145 (nitrogen ions). The device is designed to obtain relatively large ion currents, which will make it possible to realize experiments with beams against internal and remote targets. The principal parameters of the cyclotron include: pole diameter, 2400 mm; magnetic structure, tri-sector and weakly spiral; gaps, 230 mm (hill) and 960 mm (valley); magnetic field in center, 4000-17,000 oersteds;  
 Card 1/3



• L 2273-66

ACCESSION NR: AT5007942

total electromagnetic power, 2800 kilowatts; electromagnet's weight, 720 tons; frequencies of resonance system, 5-22 megahertz; accelerating voltage in Dee, 125 kilovolts; Dee gap, 50 mm; high-frequency load, 600 kilowatts; stability,  $10^{-4}$  (winding currents),  $10^{-5}$  (frequency of accelerating voltage), and  $10^{-3}$  (its amplitude). After deflection the beam is directed into a commutating magnet by which the beam can be directed against targets set up in three experimental rooms: (I) high-intensity beams, (II) neutron time-of-flight experiments, and (III) nuclear precision spectroscopy with electromagnetic monochromator. Ion-optical channeling, focusing and commutating of the beam are done by six pairs of quadrupolar lenses, two identical rotary electromagnets, a monochromator electromagnet, and two small electromagnets for correction of the beam in the vertical direction. The resonance system is a quarter-wave coaxial line ending with the 180-degree Dee. The resonant frequency is reset by remote displacement of a plate without disrupting the vacuum. The frequency is established with an accuracy of 5-18 kc plus or minus. Smooth high-frequency regulation is provided by two trimmers, permitting regulation of frequency to 2-4%. The high-frequency oscillator has a capacitive connection with the resonance system. A connecting rod is used, without disruption of the vacuum, to shift the Dee in the vertical and horizontal planes, and also along its own axis. The accelerator chamber consists of two sections: a high-vacuum chamber able to exhaust, along with the resonant line, the magnetic gap; and a fore-vacuum section

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L 2273-66

ACCESSION NR: AT5007942

2  
installed in the electromagnet poles. Remotely controlled measuring probes and targets for operating with the internal beam are installed in the chamber. Placement of the ion source is also done remotely; moreover, it is possible, without disruption of the vacuum, to shift the cathode and also the source as a whole. The magnetic field was modelled with an electromagnet having a pole diameter of 342 mm, on which several alternative magnetic systems were investigated; and also with an electromagnet having a pole diameter of 685 mm, which was used to investigate in detail modifications in the weakly-spiral structure. On the basis of the electromagnet with poles 685 mm in diameter, a start has been made at the present time on a cyclotron with three-dimensional variation of the magnetic field, with the magnetic system of a type described in the present report. The current cyclotron will accelerate protons up to 8 Mev and deuterons up to 4 Mev, which will permit investigations into various alternative systems for yielding beams. Orig. art. has: 6 figures.

ASSOCIATION: Nauchno-issledovatel'skiy institut elektrofizicheskoy apparatury imeni D. V. Yefremova GKAE SSSR (Scientific Research Institute of Electrophysical Equipment, GKAE SSSR)

SUBMITTED: 20 May 64

NO REF SOV: 000

ENCL: 00

OTHER: 001

SUB CODE: EE, NP

Card 3/3

ACCESSION NR: AP4041697

S/0181/64/006/007/1987/1995

AUTHORS: Nikanorov, S. P.; Stepanov, A. V.

TITLE: Effect of the temperature on the elastic properties of crystals of alkali-halide compounds

SOURCE: Fizika tverdogo tela, v. 6, no. 7, 1964, 1987-1995

TOPIC TAGS: single crystal, crystal anisotropy, alkali halide, elastic modulus, lattice constant

ABSTRACT: Since the laws governing the elastic anisotropy of crystals over a wide temperature range are still unknown, the authors made a systematic analysis of their earlier findings on the temperature variations of the elastic constants of single-crystal alkali-halide compounds. The substances studied were LiF, NaF, NaCl, KCl, KBr, KI, CsBr, and CsI, and the details were reported in several published papers (ZhETF v. 29, 660, 1955 and v. 37, 1814, 1959; FTT

Card 1/3

ACCESSION NR: AP4041698

S/0181/64/006/007/1996/2002

AUTHORS: Nikanorov, S. P.; Nran'yan, A. A.; Stepanov, A. V.

TITLE: On the theory of the temperature dependence of the elastic constants of alkali-halide crystals

SOURCE: Fizika tverdogo tela, v. 6, no. 7, 1964, 1996-2002

TOPIC TAGS: single crystal, alkali halide, crystal anisotropy, elastic modulus, lattice constant

ABSTRACT: This is a continuation of a series of earlier studies (ZhETF v. 29, 669, 1955 and v. 37, 1814, 1959; FTT v. 3, 2872 and 3551, 1961; v. 4, 570 and 2576, 1962; v. 5, 619, 1963) of the effect of temperature on the elastic constants of single-crystal LiF, NaF, NaCl, KCl, KBr, KI, CsBr, and CsI, from room temperature to nearly the melting point. In this article the results are compared with the theory of Leibfried and Hahn (Zs. Phys. v. 150, 497, 1958) and

Card

1/2

ACCESSION NR: AP4034057

S/0126/64/017/004/0592/0600

AUTHORS: Klyavin, O. V.; Stepanov, A. V.

TITLE: The influence of the state of the surface on the unevenness of deformation of aluminum at a temperature of 1.3K

SOURCE: Fizika metallov i metallovedeniye, v. 17, no. 4, 1964, 592-600

TOPIC TAGS: plastic deformation, tensile stress, grain size, yield stress, aluminum/ AD 1 aluminum rod, PMT 3 microhardness apparatus

ABSTRACT: The authors studied the effect of surface conditions obtained by different metal treatments (cold working, annealing, pickling, electropolishing) and of grain size on the unevenness of plastic deformation (under tension) of polycrystalline Al (99.3%) at 1.3K. The specimens were prepared from AD-1 brand rods in the form of pins having a working length of 20 mm and a diameter of 2 mm. The grain sizes used were 130-150 microns (annealed at 400C for 3 hours). The studies were conducted on specimens having 3 different surface conditions: 1) after electropolishing in solutions of 250 ml of glycerine, 168 ml of methyl alcohol and 70 ml of HCl; 2) after chemical pickling in solutions of HCl for 9 hours, HNO<sub>3</sub> for 3 hours, HF for 2 hours, and H<sub>2</sub>O for 5 hours; 3) in the original state

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ACCESSION NR: AP4034057

after preparation of the specimen. After the surface treatment at room temperature, the specimens were cooled to 1.3K and deformed until failure by tension in a machine described in an earlier work by the authors (FMM, 1959, 8, 274). The microhardness of the surface of the working part was tested in a PMT-3 apparatus at 300K at a load of 1 g. In the stress-strain diagram of the unannealed specimens with pickled surfaces, a sharp decrease in the value of the yield limit from 17 to 2 kg/cm<sup>2</sup> was observed, and there was also a sharp decrease in the number of tracks. Electropolishing also decreased the number of tracks, but this effect was considerably weaker than in the case of pickling. The plot of the number of tracks versus the diameter of the specimens showed an abrupt occurrence of a minimum. The behavior of annealed specimens was essentially different from that of the unannealed specimens. In the first case polishing and pickling reduced the number of tracks roughly by the same degree. This effect was not as pronounced as in the case of unannealed specimens. Moreover, the range of diameters where the number of tracks reached a minimum was twice as large as that in the case of unannealed specimens. The increase of grain size caused an increase in the unevenness of deformation and an increase in the number of tracks. The authors thank B. I. Sidorov and L. P. Vakhmyanin for helping with the measurements. Orig. art. has: 5 figures.

Card 2/3

ACCESSION NR: AP4034057

ASSOCIATION: Fiziko-tekhnicheskii institut im. A. F. Ioffe AN SSSR (Physico-technical Institute, AN SSSR)

SUBMITTED: 24Apr64

ENCL: 00

SUB CODE: MM

NO REF SOV: 013

OTHER: 001

nb -

набрав

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Card 3/3

KAZARNOVSKIY, M.V.; STEPANOV, A.V.

Method of time correlation functions and its use in the theory of shifts  
and deformations of the Mössbauer line. Zhur. eksp. i teor. fiz. 47  
no.2:543-557 Ag '64. (MIRA 17:10)

1. Fizicheskiy institut imeni P.N.Lebedeva AN SSSR.



L 1981-66 EWT(m)/I/EWA(m)-2

ACCESSION NR: AT5018598

UR/2504/65/033/000/0203/0234

AUTHOR: Kazarnovskiy, M. V.; Stepanov, A. V. 44,55 44,55

34  
28  
5+1

19,4

TITLE: Method of temporal correlation functions in the description of interactions of various particles with a complex system, and its applications

SOURCE: AN SSSR. Fizicheskiy institut. Trudy, v. 33, 1965. Issledovaniye atomnogo yadra s pomoshch'yu zaryazhennykh chastits i neytronov (Investigation of the atomic nucleus using charged particles and neutrons), 203-234

TOPIC TAGS: correlation function, particle interaction, differential cross section, scattering cross section

ABSTRACT: The expression first derived by L. Van Hove (Phys. Rev. v. 95, 249, 1954) for the differential cross section of the scattering of particles or light quanta by a more complicated system (molecule, crystal), in terms of space-time pair correlation functions, is universal and applied to all kinds of interacting particles and systems, differing only in the interaction operator, which can be regarded as a dynamic variable characterizing the studied system. A formalism is developed which makes it possible to express in terms of certain temporal correlation functions (TCF) the probabilities of interaction of arbitrary incident particles or radiation with the system under investigation. Relations are established

Card 1/3

L 1981-66

ACCESSION NR: AT5018598

3

between the TCF corresponding to different types of variables and different interactions, and their general behavior for long and short time intervals is investigated. It is shown that the TCF should in general be complex, and the vanishing of the complex part signifies an approach to the classical limit and neglect of recoil effects. If the system in question is in thermal equilibrium, then the real and imaginary parts of the TCF are connected by relations that are derivable from Nuyquist's fluctuation-dissipation theorem. The particular case of a system whose degrees of freedom can be separated into fast (ballistic) and slow (adiabatic) components and the particles interact only with the ballistic component is considered. The formalism is expanded to include the case when the damping of the initial state is significant. Other particular cases studied are the shift and deformation of the Mossbauer line resulting from the difference in the Hamiltonians of the atomic motion when the Mossbauer nucleus is in the ground and excited states, respectively, the scattering of ultracold neutrons in inhomogeneous media, and resonant scattering of slow neutrons and  $\gamma$  quanta in atomic systems describable by simple models. The advantages of the proposed formalism and further applications are discussed briefly in the conclusion. "The authors thank D. A. Krizhnits for useful discussions." Orig. art. has: 115 formulas. 44,55

Card 2/3

L 1981-66

ACCESSION NR: AT5018598

ASSOCIATION: Fizicheskiy institut AN SSSR (Physics Institute, AN SSSR) 44,55 3

SUBMITTED: 00

ENCL: 00

SUB CODE: NP

NR REF SOV: 009

OTHER: 012

Card <sup>KC</sup> 3/3

L 12175-66 EWT(m)/EWA(d)/EWP(t)/EWP(z)/EWP(b) MJW/JD

ACC NR: AP6000173

UK/0148/65/000/009/0080/0085

AUTHOR: <sup>44,55</sup> Melikhov, P. I., <sup>44,55</sup> Stepanov, A. V. 52  
B

ORG: none

TITLE: Effect of new methods of melting and argon degassing on the properties of EP-65 stainless steel <sub>16</sub> <sup>44,55</sup> 18

SOURCE: IVUZ. Chernaya metallurgiya, no. 9, 1965, 80-85

TOPIC TAGS: induction melting, electroslag melting, argon, degassing, nonmetallic inclusion/EP-65 stainless steel

ABSTRACT: EP-65 steel is used to fabricate high-load-bearing elements that withstand temperatures of up to 500°C, and its melting involves the formation of a large amount of gases and nonmetallic occlusions which cause hairline cracks and other defects in the products and reduce the mechanical properties of the steel. In this connection, the authors investigated the effect of new production techniques -- vacuum induction melting, electroslag melting and argon degassing -- on the quality of this steel. Argon degassing was carried out by bubbling argon through a ladle of 500 kg capacity, via a porous refractory plug at ladle bottom, for 2-3 min; the plug was designed by the authors (Fig. 1). The steel from the induction furnaces and after argon degassing was cast into ingots weighing 50 and 100 kg. The 50-kg ingots were used to prepare

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L 12175-66

ACC NR: AP6000173

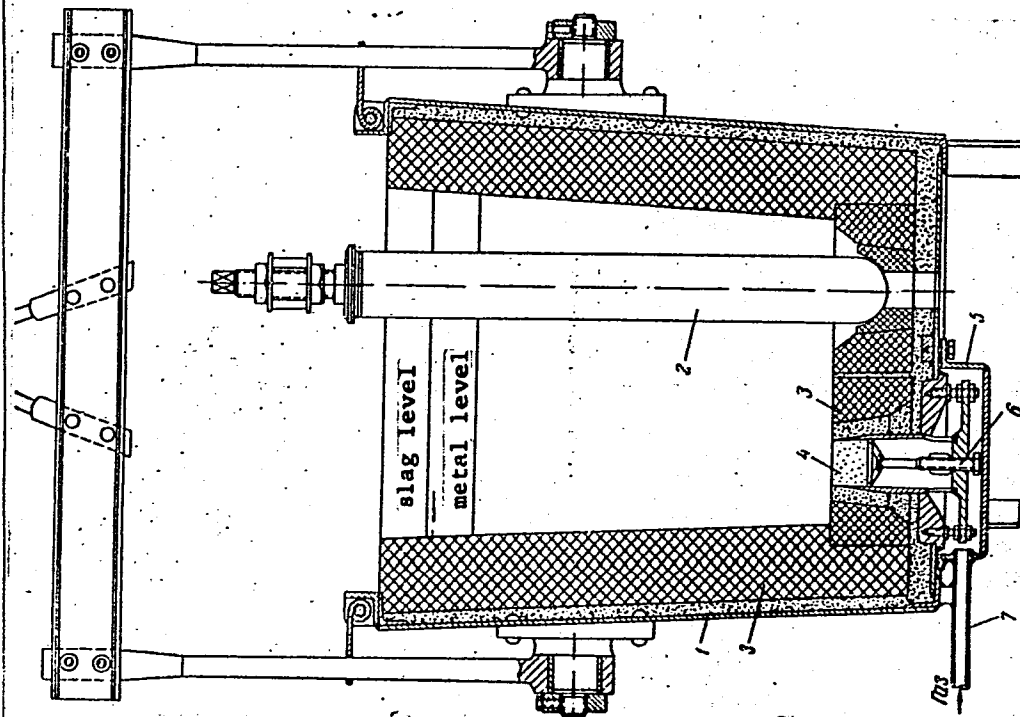


Fig. 1. Ladle of 500-kg capacity with porous plug at bottom  
1 - ladle casing; 2 - stopper; 3 - ladle lining;  
4 - porous plug; 5 - gas supply box; 6 - check screw; 7 - gas supply tube

Card 2/3

L 12175-66

ACC NR: AP6000173

specimens and the 100-kg ingots, as consumable electrodes for remelting in a vacuum induction furnace ( $2 \cdot 10^{-2}$  to  $5 \cdot 10^{-3}$  mm Hg), or in an ANF-6 electroslag furnace. Findings: the chemical composition of the steel following vacuum-induction and electroslag melting and argon degassing was the same as that of original steel. On the other hand, the macrostructure of the ingots obtained by vacuum-induction and electroslag melting was uniformly compact and lacked visible traces of shrinkage porosity and other macrostructural defects, whereas ingots of original steel displayed a distinct shrinkage porosity. Compared with the original steel, the gas content and contamination by nonmetallic oxide inclusions (as determined by the electrolytic dissolution method) of the steel melted in vacuum-induction and electroslag furnaces and argon-degassed are much lower. Further, the mechanical properties (impact strength, plasticity, relative elongation) of the steel melted by the vacuum-induction and electroslag methods and argon-degassed are superior to those of the original steel, and the anisotropy of these properties is smaller, owing chiefly to the marked decontamination of the steel with respect to nonmetallic oxide inclusions. Orig. art. has: 3 figures, 4 tables.

SUB CODE: 11, 13/ SUBM DATE: 23Jul64/ ORIG REF: 000/ OTH REF: 000

Card

FW  
3/3

L 02355-67 EIT(m)/EIP(t)/ETI/EIP(k) IJF(c) JD/WW/HW/JG

ACC NR: AR6029490

SOURCE CODE: UR/0137/66/000/006/D005/D005

AUTHOR: Gol'dfarb, V. M. ; Donskoy, A. V. ; Stepanov, A. V. 28  
b

TITLE: Some problems of embossing in direct drawing of articles from a molten mass b

SOURCE: Ref. zh. Metallurgiya, Abs. 6D34

REF SOURCE: Uch. zap. Leningr. gos. ped. in-ta im. A. I. Gertsena, no. 265, 1965, 61-74

TOPIC TAGS: embossing, direct drawing, molten mass, pipe, rod b

ABSTRACT: Problems of drawing strips, circular cores, circular pipes, and some compound sections and articles using floating-die impression molds with variable slot widths are discussed. Technical recommendations and conclusions are given. [Translation of abstract].

SUB CODE: 13/

Card 1/1 d

UDC: 621.771.001

L 25110-65 EWT(m)/T/EWP(b)/EWP(t) IJP(c) JD

S/0181/65/007/001/0194/0199

ACCESSION NR: AP5003435

AUTHOR: Tsilvinskiy, S. V.; Stepanov, A. V.

TITLE: Production of germanium single crystals of prescribed shape

SOURCE: Fizika tverdogo tela, v. 7, no. 1, 1965, 194-199

TOPIC TAGS: germanium, single crystal, crystal growth

ABSTRACT: With an aim at producing thin single-crystal plates directly from the melt, without resorting to cutting up large crystals, the authors describe a modification of a method originally proposed and described by one of the authors (Stepanov, ZhTF v. 29, 381, 1959 and 394, 1959). In this modification the crystal shape is produced by the surface-tension forces under conditions when the crystal is drawn upward from the melt. The method is closely related to the method is illustrated in Fig. 1 of the enclosure. the shape of the dis

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ACCESSION NR: AP5003435

through the slot at a pressure (5--6 g/cm<sup>2</sup>). The crystallographic orientation of the growing crystal is determined either by the orientation of the primer or by the orientation of the crystal which "crowds out" its neighbors. The drawing rate was 5 and 10 cm/hr. Different types of crystals were obtained and their characteristics are described in some detail. "The authors thank Professor Doctor of Physical and Mathematical Sciences V. M. Tuchkevich for interest in the work, A. A. Lebedev of FTI for valuable advice, and the laboratory members Candidate of Physical and Mathematical Sciences O. V. Klyavin, Yu. M. Chernov, engineer L. S. Shumeyko, and mechanic D. A. Baturin for help with the work." Orig. art. has: 6 figures and 1 table.

ASSOCIATION: Fiziko-tehnicheskiy institut im. A. F. Ioffe AN SSSR, Leningrad  
(Physicotechnical Institute, AN SSSR)

SUBMITTED: 17Jan64

ENCL: 01

SUB CODE: SS

NR REF SOV: 004

OTHER: 001

Card 2/3

L 25110-65

ACCESSION NR: AP5003435

ENCLOSURE: 01

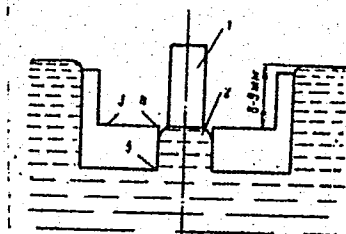


Fig. 1. Diagram showing production of germanium crystal of prescribed shape. 1 - Crystal, 2 - melt column, 3 - shaping die, 4 - upper edge of slot, 5 - lower edge of slot.

Card 3/3

MELIKHOV, P.I.; STEPANOV, A.V.

Effect of new methods of smelting and blowing by argon on the  
properties of EP-65 stainless steel. Izv. vys. ucheb. zav.;  
chern. met. 8 no.9:80-85 '65. (MIRA 18:9)

L 5138-66 EWT(1)/EWT(m)/T/EWP(t)/EWP(b)/EWA(c) IJP(c) JD/JW

ACCESSION NR: AP5018723

UR/0070/65/010/004/0539/0546  
548.53

AUTHOR: Gol'dfarb, V. M.; Gol'tsman, B. M.; Donskoy, An. V.; Stepanov, A. V.

TITLE: Thermal conditions for the process of crystallization by drawing from a melt

SOURCE: Kristallografiya, v. 10, no. 4, 1965, 539-546

TOPIC TAGS: crystal growing, crystallization, thermodynamic property

ABSTRACT: The crystallization technique dealt with in the article was developed previously by one of the authors (Stepanov, Zh. tekhn. fiz. v. 29, 381 and 394, 1959 and elsewhere). The authors derive relations for the determination of the thickness of the crystal (s) as a function of the drawing rate (v), the melt temperature (T), the heat transfer coefficient ( $\alpha$ ), the height of the crystallization front(h), which is assumed to be plane, and other thermodynamic characteristics of the crystallizing material. It is assumed that the process is stationary, the crystal is not confined from above, the crystallization takes place at a fixed temperature, the crystal is quite thin, and the thermodynamic characteristics of the material are independent of the temperature. Crystallization parameters, which are a combination of the thermodynamic properties of the material and facilitate comparison of the crystallization conditions of various materials, are introduced

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L 5138-66

ACCESSION NR: AP5018723

and the crystallization behavior of numerous metals is compared. The results of the derived analytic equations are in satisfactory agreement with experiment. Orig. art. has: 4 figures, 19 formulas, and 3 tables. 3

ASSOCIATION: Leningradskiy gosudarstvennyy pedagogicheskiy institut im. A. I. Gertsena (Leningrad State Pedagogical Institute) 44.25

SUBMITTED: 02Sep64

ENCL: 00

SUB CODE: SS

NR REF SOV: 008

OTHER: 001

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Card 2/2

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Card 2/2

L 15970-66 EWT(1)/EWT(m)/T/EWP(t)/EWP(k)/EWP(b) LJP(c) JD:AW/HW/JG/GG

ACC NR: AT6002272

(N) SOURCE CODE: UR/2564/65/006/000/0360/0364

AUTHOR: Gol'dfarb, V.N.; Donskoy, A.V.; Stepanov, A.V.

ORG: none

TITLE: Some problems of shaping during crystallization by pulling from a melt.  
(Paper presented at the Third Conference on Crystal Growing held in Moscow from 18 to 25 November, 1963.)

SOURCE: AN SSSR. Institut kristallografii. Rost kristallov, v. 6, 1965, 360-364

TOPIC TAGS: metal crystallization, crystal growing, aluminum alloy, metal tube

ABSTRACT: Among the relationships between the characteristics of the process of pulling thin crystals from melts, an important one is the relationship between the geometry of the shaper slit, height of the crystallization front, and geometry of the crystal being pulled. The following rules were established for the pulling of tubes of aluminum alloys: (1) The more the shape of the sample deviates from the shape of the slit, the higher the crystallization front; (2) The decrease in thickness in sections with small radii of curvature is slower; (3) As the height of the crystallization front rises, the dependence of the thickness of the sample on the slit width decreases, and the dependence on the cooling and pulling

Card 1/2

L 15970-56

ACC NR: AT6002272

rate increases; (4) A rise of the melt level causes an increase in the thickness of the tube. To determine the dependence of the thickness of the crystal on the pulling rate  $v$ , cooling rate (heat transfer coefficient  $\alpha$ ), overheating of the melt  $\Delta T$ , and shaper slit width, results of a solution of the thermal and capillary problem were used. The calculations were compared with measurements of the thickness of ribbons pulled with local cooling, and the agreement was considered satisfactory. The method of calculation is applicable not only to ribbons, but to crystals of other shapes as well. Orig. art. has: 6 figures.

SUB CODE: 11, 20 / SUBM DATE: none / ORIG REF: 006 / OTH REF: 001

pulling tubes from molten metals

18, 44, 55

bvk

Card 2/2

STEPANOV, A.V.; MAKAROVA, T.P.

Electric migration study of trivalent plutonium complex  
formation in solutions of ethylenediaminetetraacetic acid.  
Radiokhimiia 7 no.6:664-669 '65.

Using the electric migration method for studying Am<sup>III</sup>  
complex oxalates. Ibid.:670-673

(MIRA 19:1)



L 47549-66 (m)/EMP(t)/ETI/EMP(k) IUP(c) JD/WW/HW/JG/JH

ACC NR: AR6029187

SOURCE CODE: UR/0137/66/000/006/D040/D040

AUTHOR: Donskoy, A. V.; Stepanov, A. V. 39

TITLE: Production of flattened thin-walled pipe (pipe in sheet) from molten metal 2

SOURCE: Ref. zh. Metallurgiya, Abs. 6D276 14

REF SOURCE: Uch. zap. Leningr. gos. ped. in-ta im. A. I. Gertsena, no. 265, 1965, 33-41

TOPIC TAGS: pipe, thin walled pipe, aluminum pipe, copper pipe, brass pipe, heat exchange equipment

ABSTRACT: The production of pipes from sheet is investigated. Pipes made from aluminum, copper and brass sheet are widely used in the construction of heat-exchange equipment, refrigerators and air conditioning units. Orig. art. has: 8 figures and a bibliography of 8 reference items. L. Kochenova. [Translation of abstract] [AM]

SUB CODE: 13/

Card 1/11

UDC: 621.774.37:669.3'71

L 17622-66 EWT(1)/EWT(m)/T/EWP(t) IJP(c) JD/JG/GG

ACC NR: AP6006850

SOURCE CODE: UR/0181/66/008/002/0569/0570

AUTHOR: Tsivinskiy, S. V.; Koptev, Yu. I.; Stepanov, A. V.

ORG: Physicotechnical Institute im. A. F. Ioffe, Leningrad (Fiziko-tekhnicheskiy institut)

TITLE: Growing germanium crystal platelets

SOURCE: Fizika tverdogo tela, v. 8, no. 2, 1966, 569-570

TOPIC TAGS: germanium, single crystal growth, germanium single crystal, semiconductor, single crystal, oriented crystallization

ABSTRACT: The capillary process of crystal formation was applied to grow thin (0.1—3 mm) single crystal germanium platelets or strips. Single crystal strips 15—45 mm wide and 80—90 mm long with narrow edges 1.25—3.5 mm thick were grown from Ge melt by pulling the seed which was a tungsten or germanium single crystal thin platelet inserted into grooves of two parallel tungsten rods as shown in Fig. 1. The tungsten rods acted as a vehicle for the melt and as a frame for the liquid film, because of the meltability of tungsten. The liquid film was formed on the seed owing to the forces of surface tension. Crystallization at the melt-seed interface occurred under given [unspecified] temperature conditions, ~ 1.5 mm above the upper

Card 1/2

L 17622-66

ACC NR: AP6006850

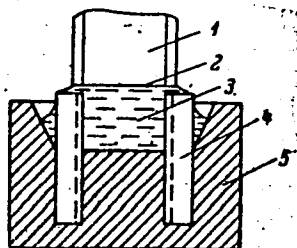


Fig. 1. Growth of thin strips of Ge crystal

1 - Ge strip; 2 - melt interface;  
3 - melt; 4 - tungsten rods; 5 -  
graphite crucible.

end of the rods. The surface of the grown strips was nearly mirror-like. The technique can be applied to growing strips of other metals. Orig. art. has: 2 figures.

[JK]

SUB CODE: 20/ SUBM DATE: 17Jul65/ ORIG REF: 002/ ATD PRESS: 4210

Card 212 7795

L 21933-66 EWT(1)/EWT(m)/FCC DIAAP GW  
 ACC NR: AP6014487 SOURCE CODE: UR/0089/65/019/005/0472/0474  
 AUTHOR: Gedeonov, L. I.; Dmitriyev, V. N.; Nelepo, B. A.; Stepanov, A. V.; Yakovleva, G. V. 110  
 ORG: none 36  
 TITLE: Radioactivity of the air over the Atlantic Ocean in May to July, 1964 B  
 SOURCE: Atomnaya energiya, v. 19, no. 5, 1965, 472-474  
 TOPIC TAGS: atmospheric radioactivity, radioactive fallout, research ship, radioactive aerosol  
 ABSTRACT: The radioactivity of the air and the fallout over the Atlantic Ocean were studied during the 15th cruise of the research ship Mikhail Lomonosov. The samples were collected by filtering the air and allowing the fallout to deposit on a sticky surface. The samples collected south of 8° latitude south, north of 8° latitude north, and between 8° latitude south and 8° latitude north were determined jointly. Comparison of the results with those obtained during the 12th cruise of the ship, at the end of 1962, revealed that, because nuclear testing in the atmosphere was stopped the specific activity of the aerosols in the lower layer of the atmosphere decreased by about an order of magnitude. Within 38 and 5° latitudes north, the concentration of the aerosols was practically independent of the place of collection, due to the mixing of the atmosphere by the trade winds. No direct correlation could be established between the concentration of radioactive aerosols and the fallout  
 Card 1/2 UDC: 551.594.1:541.182.2

L 21933-66

ACC NR: AP6014487

rate, on one hand, and the average daily values of the atmospheric pressure, and temperature, on the other hand. The high fallout rate in the equatorial region was due to the heavy prevailing rainfall. The aerosol concentration was much lower in the equatorial region and the southern hemisphere than in the northern hemisphere. Averaged data of previous cruises indicated that the highest fission product concentrations are distributed between 14 and 40° latitude north; the activity of the air in the southern hemisphere amounted to only 10% of that in the northern hemisphere. The authors thank V. M. Vdovenko and A. G. Kolesnikov for making possible the completion of this work. Further thanks is rendered I. N. Maksimov and L. N. Sysoyevaya for their assistance in processing the results of the research. Orig. art. has: 4 figures and 1 table. [NA]

SUB CODE: 18, 04 / SUBM DATE: 01Mar65 / ORIG REF: 003

Card 2/2 nst

L 03766-67 EWT(m)/EWP(t)/ETI/EWP(k) IJE(c) JD/WW/HW/JG

ACC NR: AR6029496

SOURCE CODE: UR/0137/66/000/006/D036/D036

AUTHOR: Donskoy, A. V. ; Kostygov, A. S. ; Klitin, N. P. ; Lokshin, V. A. ; Stepanov, A. V.

TITLE: Production of longitudinally ribbed pipe from molten metal and the investigation of thermal and manufacturing properties of the pipe

SOURCE: Ref. zh. Metallurgiya, Abs. 6D251

REF SOURCE: Uch. zap. Leningr. gos. ped. in-ta im. A. I. Gertsena, no. 265, 1965, 12-32

TOPIC TAGS: pipe, ribbed pipe, convective heat exchange

ABSTRACT: Longitudinally-ribbed pipes produced from molten metal by the A. V. Stepanov method possess a combination of properties which in a number of cases, makes them suitable for use in the production of heat-exchange equipment. The convective heat exchange in clusters of longitudinal pipe has a pattern identical to internal heat exchange in channels during longitudinal joining. The production technology of longitudinally ribbed pipes is discussed in detail. Orig. art. has: 14 figures. L. Kochenova. [Translation of abstract] [AM]

SUB CODE: 13/

Card 1/1

UDC: 621.771.35

L 08339-67 EWT(m)/EWP(t)/ETI/EWP(k) IJP(c) JD/HW/WB

ACC NR: AR6033103

SOURCE CODE: UR/0137/66/000/007/G028/G029

AUTHOR: Gol'dfarb, V. M.; Kostygov, A. S.; Yukhno, M. M.; Stepanov, A. V.

TITLE: Obtaining <sup>27</sup>copper, <sup>15</sup>brass, and <sup>16</sup>bronze rods directly from the melt 40

SOURCE: Ref. zh. Metallurgiya, Abs. 7G236

REF SOURCE: Uch. zap. Leningr. gos. ped. in-ta im. A. I. Gertsena, v. 265, 1965, 144-150

TOPIC TAGS: molten metal, drawing, rod drawing

ABSTRACT: Laboratory experiments have been carried out for producing rods from copper, bronze, and brass by drawing directly from the melt.<sup>16</sup> The process of drawing is similar to that for aluminum alloys. The drawing equipment consists of an induction furnace with a vacuum-tube generator and a graphite-fireclay crucible; a protective atmosphere is recommended so as to ensure a smooth surface and minimize both oxidation<sup>16</sup> and burning out the alloy components. Orig. art. has: 2 figures and 1 table. Bibliography of 6 titles. [Translation of abstract]

SUB CODE: 11/

Card 1/1 nst

UDC: 669.3.04

L 47350-66 EWP(m)/EWP(t)/ETI/EWP(k) IJP(c) JN/WW/HW/JG/JH

ACC NR: AR602949:

SOURCE CODE: UR/0137/66/000/006/D033/D034

AUTHOR: Gol'dfarb, V. M.; Donskoy, A. V.; Stepanov, A. V.

TITLE: Drawing of molten aluminum-manganese alloy into strip

SOURCE: Ref. zh. Metallurgiya, Abs. 6D233

REF SOURCE: Uch. zap. Leningr. gos. ped. in-ta im. A. I. Gertsena, no. 265, 1965, 50-60

TOPIC TAGS: drawing, strip, alloy, alloy strip

ABSTRACT: The results of an investigation of drawing of molten aluminum-manganese alloy into strip and properties of the latter are given. The thickness of strip is determined in relation to the intensity of air blowing (air expenditure), the drawing rate, the melt temperature, and its level with respect to the upper plane of the floating die and the width of the slit of the latter. Both the macro- and microstructures of the material and its mechanical properties are investigated. A diagram of the casting device is given in the original article. N. Yudina. [Translation of abstract] [AM]

Producing strip from molten metal

SUB CODE: 13/

Card 1/1

UDC: 621.771.24:669.71



L 40235-66 EWT(M)/EWI(L)/ETI/ENF(k) JD

ACC NR: AP6019647

SOURCE CODE: UR/0149/66/000/003/0138/0143

AUTHOR: Gol'dfarb, V. M.; Gol'tsman, B. M.; Donskoy, A. V.; Stepanov, A. V. 44  
B

ORG: Leningrad State Teachers Institute (Leningradskiy gosudarstyennyy pedagogicheskiy institut)

TITLE: Production of thin-walled products from a melt with air blowing 14

SOURCE: IVUZ. Tsvetnaya metallurgiya, no. 3, 1966, 138-143

TOPIC TAGS: molten metal, metal drawing, metallurgic process, cooling

ABSTRACT: A method for the uniform cooling of products by blowing with air is examined. A cooler which provides a high value of the heat-transfer coefficient at a small distance from the crystallization front is described. In this device a stream of air is directed through a blowing slot to the surface of the product and is deflected by it upward and partially downward. Downward blowing depends upon the distance and shape of the edge of the blowing slot; it should not be appreciable since a strong air stream deforms the meniscus of the melt and lowers the temperature of the mold. A strip of the product 5-10 mm wide is under the effect of a normal air flow and adjacent parts of the surface are under the effect of a tangential flow. Various types of coolers are used for cooling products of a complex shape. The velocity of the air flow

Card 1/2

Card

2/2

90

L 26111-66 ENT(m)/I/ENT(t)/ENT(k) IJP(c) JJ/HW

ACC NR: AP6015075

SOURCE CODE: UR/0363/66/002/005/0950/0950

AUTHOR: Antonov, P. I.; Stepanov, A. V. 43  
B

ORG: Physiotekhnical Institute im. A. F. Ioffe, Academy of Sciences  
SSSR (Fiziko-tekhnicheskiy institut Akademii nauk SSSR)

TITLE: Preparation of tubular germanium crystals 18 27 18

SOURCE: AN SSSR. Izvestiya. Neorganicheskiye materialy, v. 2, no. 5,  
1966, 950

TOPIC TAGS: crystal growth, semiconductor crystal, germanium crystal,  
tubular crystal, melt grown crystal

ABSTRACT: Semiconductor germanium crystals of tubular form were  
obtained directly from the melt by Czochralski technique with the help  
of a forming device which is schematically drawn in Fig. 1. The  
preparation of crystalline products of a given form directly from the  
melt is especially important for materials which are difficult to  
machine. Germanium crystals of tubular form were grown on a germanium  
single crystal plate or tungsten foil, as a seed. A ring-shaped column  
of the melt was raised by capillary forces on pulling the seed from the  
melt. Under proper temperature conditions, the growing crystal takes  
the shape of the forming graphite cylinder. Either crucible alone, or 2

Card 1/2

UDC: 546.289:548.19

L 26111-66

ACC NR: AP6015075

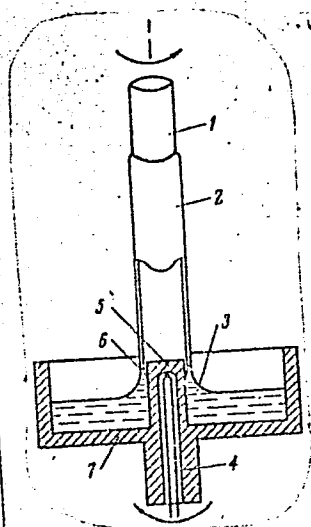


Fig. 1. Schematic drawing of the forming device:

1 - Seed; 2 - growing tubular crystal; 3 - melt; 4 - thermocouple; 5 - forming cylinder; 6 - crystallization front; 7 - crucible.

crucible and the seed were rotated at 2 rpm. At a growth rate of 0.5—2.0 mm/min. polycrystalline tubes 8—20 mm in diameter with a wall thickness of 1—2 mm were grown which may be used as sensing elements of a strain gage to measure mechanical stresses in solids. Orig. art. has: 2 figures. [JK]

SUB CODE: 20/  
SUBM DATE: 07Oct65/  
ORIG REF: 001/  
ATD PRESS: 4251.

Card 2/2

L 42246-66 ENT(m)/EWP(r)/T/EWP(t)/ETI IJP(c) JD/HW  
ACC NR: AP6023910 SOURCE CODE: UR/0363/66/002/007/1177/1179

AUTHOR: Tsivinskiy, S. V.; Stepanov, A. V.

ORG: Physicotechnical Institute im. A. F. Ioffe, Academy of Sciences, SSSR (Fiziko-  
tekhnicheskii institut Akademii nauk SSSR)

TITLE: Possibility of controlling the distribution of impurities in the preparation  
of crystals of predetermined shape

SOURCE: AN SSSR. Izv. Neorg materialy, v. 2, no. 7, 1966, 1177-1179

TOPIC TAGS: crystal growing, semiconductor crystal, crystal impurity, pn junction

ABSTRACT: The distribution of impurities in crystals of predetermined shape grown by  
the method of A. V. Stepanov was studied on the basis of the theory proposed by J. A.  
Burton, R. C. Prim, and W. P. Slichter (J. Chem. Phys. 21, 1987, 1953). It is shown  
that when a crystal is pulled from a narrow slit or a round hole of small diameter,  
the impurity becomes evenly distributed throughout the crystal if the crystallization  
front is flat and if its position with respect to the height in the slit and the pull-  
ing rate are constant. When the slit or hole is deep, the concentration of the impur-  
ity in the crystal is equal to the concentration in the melt in the crucible. By  
varying the position of the crystallization front with respect to the height, its  
form, and the pulling rate, one can obtain a predetermined nonuniform distribution of  
the impurity. In the growing of semiconductor crystals, if the melt contains two im-

Card 1/2

UDC: 548.5